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David Taylor Research Center

Bethesda, Maryland 20084-5000

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Ship Hydromechanics Department
Technical Manual

ATHENA RESEARCH SHIP SYSTEM USERS GUIDE

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This manual was developed to provide general information regarding the ATHENA RESEARCH SHIP SYSTEM and specific data relative to the capabilities of the two ships in operation. Administrative, ship performance and ancillary equipments data are included to provide a potential user with sufficient information to judge the suitability of the ships for support of particular projects.

Potential Users are encouraged to inquire about the availability of the ships and request additional data regarding the various equipments available. Comments on the organization and utility of this "Users Guide" are welcome. Comments are solicited with respect to errors, omissions, and any areas where expanded descriptions or more complete technical data would be useful.

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FIGURES

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PREFACE

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ACKNOWLEDGEMENTS

The ATHENA RESEARCH SHIP SYSTEM was brought to the present level of readiness through the contributions of a number of users. The David Taylor Research Center (DTRC) was responsible for the development of the Compound Air Masker (CAM) system on ATHENA. The Naval Underwater System Center (NUSC) has made significant contributions to the outfitting of ATHENA for towed array tests, resulting in general enhancement of ATHENA's towing capability. The Naval Air Systems Command and Naval Coastal Systems Center (NCSC) have made significant contributions to the capabilities of ATHENA II. Other users, too numerous to mention here have contributed various improvements from time to time. Where possible, equipments have been developed to be used on both ships.

DTRC wishes to recognize these contributions and express its appreciation to all. In addition, the important contributions to this User's Guide by Douglas W. Forsyth of the Marine Services Division of Mar, Inc. are gratefully acknowledged.

INTRODUCTION

In 1976 the ATHENA* Research Ship System (ATHENA System, or System) was established to provide high-speed, sea-based, RDT&E support for several emerging programs. Managed by the David Taylor Research Center (DTRC), the purpose of the ATHENA System is to provide research vessels (R/Vs) and logistic support to a wide range of users, including all government agencies and the private sector. The intent is to provide a convenient mechanism by which project/ program managers requiring at-sea testing can avail themselves of R/V support with a minimum of paper work and red tape. The initial concept proved so successful that the scope of the System was expanded to make it possible to provide a wide range of R/Vs, such as SWATHS, offshore supply type vessels, etc., in addition to the high-speed assets owned by the government.

The purpose of this document is to inform potential users of System capabilities and provide directions for securing use of the services offered. The first part of this report addresses the ATHENA System. Details of the capabilities of the R/Vs and ancillary test support equipment and electronics are provided in Appendices A, B, C and D.

THE ATHENA SYSTEM

The ATHENA System comprises two Ashville Class (PG-84) gunboats, an engineering and logistic support system, and a simplified management structure. The PGs have been converted to R/V status. These assets are described in the Appendixes. The two converted PGs, named ATHENA and ATHENA II, are home ported at the Naval Coastal Systems Center, Panama City, FL, 32407.

The ATHENA System not only provides access to the high-speed R/Vs, but to the full spectrum of engineering and logistic support available through DTRC, any other government laboratory/center, or the marine contractor that operates the R/Vs. The System also has access to the government supply system, and special project/program needs can be satisfied by the marine contractor. Other support craft, e.g. SWATHs, SESs, offshore supply boats, etc., are also available through the System, typically on a lease/charter arrangement basis.

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*The ATHENA System was named for the Greek goddess, ATHENA, identified as being wise in industries of peace and arts of war.

ORGANIZATION & MANAGEMENT

The objective underlying the design of the ATHENA System is to provide RDT&E customers with the widest possible range of choices in the level of services to be provided, consistent with safe and efficient operation of the platforms. The system is thus designed to provide any level of services from simply driving the platforms to providing a turn-key operation.

The System functions as a DTRC Service Cost Center and is fiscally managed under the provisions of DTRCINST 7600.41. The assets of the System are managed by the ATHENA Research Ship System Management Office (ATHENA Manager, or System Manager). The actual operation of the platforms is provided by a marine contractor. The basic organization and delineation of responsibilities is shown on Figure 1.

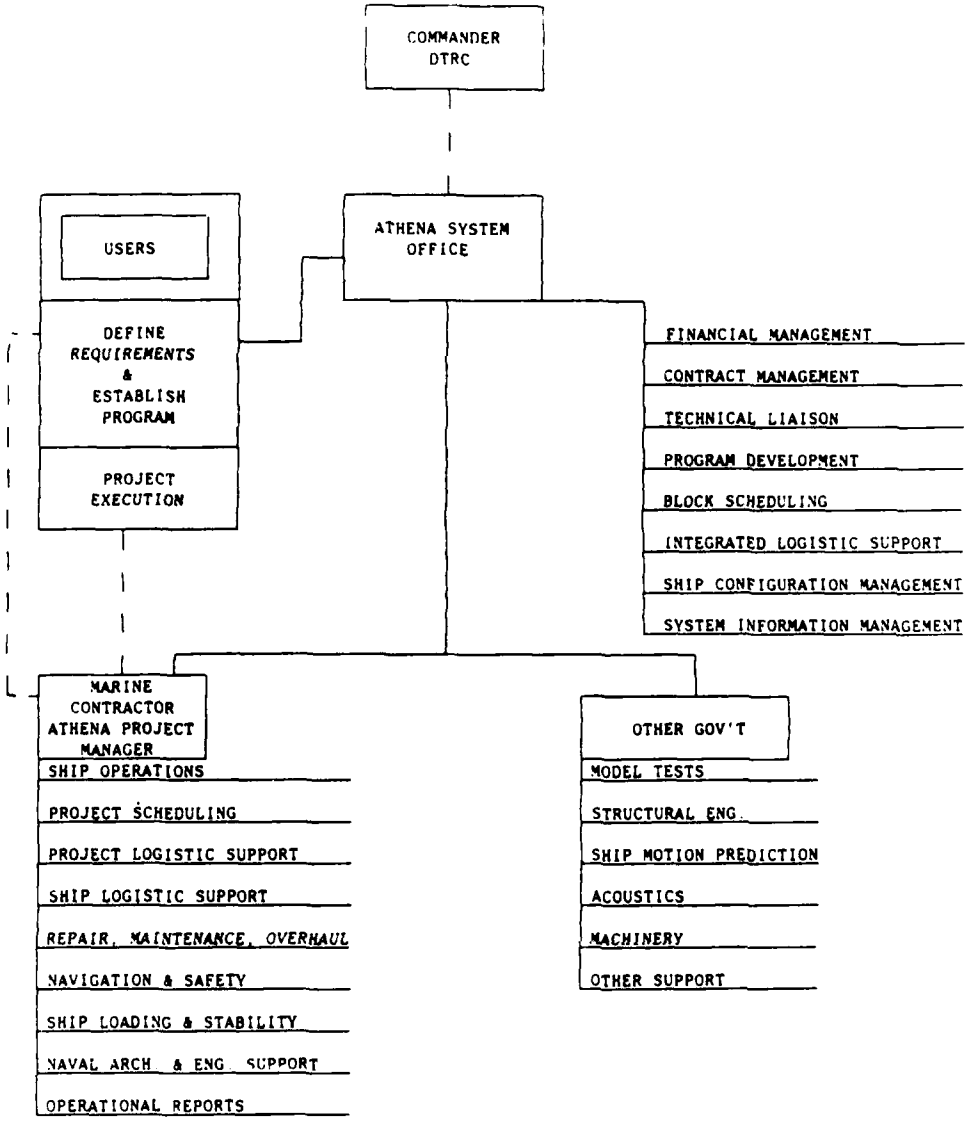

FIGURE 1 - MANAGEMENT STRUCTURE AND RESPONSIBILITY LEVELS OF THE ATHENA RESEARCH SHIP SYSTEM

The flow of work begins when a User informs the System Manager of his program requirements and a mutual agreement is reached for a block of ship time. The System Manager at the same time informs the marine contractor of the prospective requirements and the marine contractor prepares a cost estimate for marine contractor services only and forwards the estimate to the System Manager. The System Manager adds any estimated costs for non-contractor provided services (the "Other Government" side of Figure 1) and negotiates a cost estimate with the User.

After completion of these administrative matters, the User establishes direct liaison with the marine contractor with whom he jointly establishes the details of program/project timing, logistic needs, etc. The System Manager is apprised of progress by the marine contractor's ATHENA Project Manager and must approve any changes in the level of support negotiated.

For a variety of reasons schedule slippages and changes do occur in the RDT&E community. The System Manager works with Users to shift blocks of time to accommodate such changes, and through mutual cooperation, such changes have generally been resolved to the satisfaction of all parties.

In addition to the use of the ship assets, Users may have studies performed to determine the engineering feasibility and cost of major ship modifications and/or ancillary equipment or structures required to accommodate a projected RDT&E need.

In summary, the organization is designed to minimize the administrative detail required of the User and to facilitate the boarding and execution of projects.

ARRANGEMENTS FOR USE

Arrangements for use of the System are made through the DTRC ATHENA System Manager at the following address:

Mr. James A. Heffner
David Taylor Research Center
Bethesda, MD 20084-5000
Phone: (202) 227-2005 - Commercial
287-2005 - Autovon

A prospective System User should first contact the System Manager and provide a general decription of the project to be embarked, logistic needs, and estimate of time. The System Manager will negotiate a block of time with the User based on ship availability. He will then pass the requirements to the contractor's project manager who will contact the User for detailed information and develop a cost estimate.

A conference between the User, project manager and System Manager may be required if any significant alterations of the ships are needed to interface trial gear or unusual logistic demands exist. The need for such conferences is typically established on a case by case basis.

SYSTEM COSTS & ADMINISTRATIVE MATTERS

Users are responsible for the following costs:

R/V PLATFORM USE	-	A fixed per diem rate assessable for each day the ship is engaged in project work, including on-loading, off loading and transits to and from the test sites.
FUEL	-	Due to the significant variation in fuel usage between types of projects, each project is charged only for the fuel consumed in its execution.
LOGISTIC SUPPORT	-	This includes, by way of example, dockage and port fees when away from home port, drayage, crane service, welding services, etc., required by a particular project.
ENGINEERING/NAVAL ARCHITECTURAL SUPPORT	-	As required for structural, stability or project/ship interfacing studies & designs.
SHIP MODIFICATIONS	-	If required to accommodate a particular project.
SPECIAL REQUIREMENTS	-	These include, for example, diving services, other support ships, helicopter leases/rentals, photographic services, etc.

By law, the User must deposit funds with DTRC in the amount of the estimated cost prior to receiving access to the ATHENA System. On conclusion of the project, or a phase thereof, the total costs are collected and the User is billed for excess costs, if any, or any surplus remaining is refunded.

When at sea, or berthed away from home port, the User's trial personnel are provided berthing and meals. A fixed per diem rate is charged each individual for this service. Payment is made to the contract operator, who applies such funds to defray part of the ships messing and linen expenses.

Users may arrange for their own account any logistic support that does not impact the ship directly; such as crane service, drayage, small craft, flying craft, photographic services, and the like. Any services that impact the ships' structural, propulsion and electrical or electronic systems must be obtained through the marine operator to avoid questions of liability. This applies to diving services also, with the exception of U.S. Government divers.

SECURITY

MILITARY

If projects are embarked away from the home port, the User is responsible for designating the military classification of the project and forwarding appropriate clearances to the marine operator with a copy to the ATHENA System Manager. If projects are embarked at the home port, project personnel clearances shall be addressed to the Commanding Officer, Naval Coastal Systems Center, Panama City, FL 32407. The point of contact is the Captain, R/V ATHENA or R/V ATHENA II.

The marine operator's project manager is required to be cleared to the SECRET level. The Master, First Mate and Chief Engineer of both R/Vs are cleared to the level of SECRET, but the rest of the crew is required to be cleared to CONFIDENTIAL only. The User should thus attempt to compartmentize his classified operations to safeguard classified data, gear, procedures, etc. from compromise. In general, in conformance with the "need to know" principle, the Master, Mates, etc., should be given only sufficient information to enable them to perform their duties.

The ships are equipped with GSA approved combination safes suitable for storing information to the SECRET level.

SHIPS & PERSONNEL

Only pre-authorized personnel are permitted to board the vessels. Casual or non-official short-term visitors may board the vessels while at dock with the Master's permission. Personnel paying short visits for purpose of doing business with the ship, such as tradesmen, mechanics, welders, etc., may board with permission of the Master to perform their duties or obtain information pertinent thereto.

Personnel boarding at the home port, NCSC, Panama City, FL, are required to obtain a pass and badge from base security. At all other ports, personnel shall display a badge issued by the marine operator's project manager.

The ships are secured and locked when in home port after working hours. Fire and flooding alarms connected to the base fire department are activated. Project personnel desiring access to the ships after working hours must make prior arrangements with the Master. The practice of working alone on the ships is discouraged. When the ships are in any other port they are manned on a 24 hour basis and access thereto by project personnel is available at all times.

The User is responsible for providing a list of authorized project personnel (and forwarding security clearances, if required) to the marine operator's project manager. In addition, all personnel proceeding to sea must be named on the sailing list maintained by the contractor's project manager.

SAFETY

The safety of the ships in their navigation, sea worthiness and any project evolutions are the absolute responsibility of the cognizant Master, as is the safety of embarked personnel. Also, those projects embarked that place substantial additional loads on the ships are reviewed by a Naval Architect to assure that support structures are adequate and that ship stability is maintained with adequate margins.

When a project is embarked, or new project personnel report aboard, project personnel are briefed on safety procedures, life raft assignments and locations of life vests and other safety equipment. This briefing is typically given by the first mate under the Master's direction.

Other safety related details are covered in Appendix D.

PROJECT PERSONNEL RESPONSIBILITIES

The User is expected to appoint a Trial Director (TD) who functions essentially as the counterpart of the Ship's Master with respect to project personnel. It is expected that all communications between project personnel and the Ship will be executed between the TD and the Ship's Master, or his designated representative.

REPORTING ABOARD

Project personnel should report aboard at least one hour prior to sailing time. Upon arrival at the vessel project personnel must report to the first mate who will sign them aboard, check security clearances (if required) and provide an orientation of the vessel's physical arrangement. Berthing assignments are made by the Trial Director. Linens, towels, etc. will be provided at this time.

For safety, project personnel are required to accomplish the following immediately after berth assignment:

- Insure that a life jacket is in place on the assigned bunk.
- Read the watch, quarter and station bill located on the ship's bulletin aboard.
- Find the assigned life raft, fire and abandon-ship stations.
- Become familiar with the alarm signals (expect a drill on departure).

Delays in sailing are not infrequent due to the experimental nature of most programs. Sailing delays occasioned by project problems are determined by the Trial Director in consultation with the Master, and announced by the Master.

Sailing time may be delayed at the Master's discretion, also, if project personnel report aboard in a condition which he considers unsafe. Such a delay will usually establish a sailing time of 0800 hours the following day.

UNDERWAY

The ship is at the disposal of the TD to execute any and all evolutions required to achieve trial objectives, subject only to the discretion of the Master with respect to safety of the ship, personnel and trial gear. In

general, the trial party and crew must work closely and cooperatively to accomplish trial objectives. In this respect, the Ship's Master and Trial Director are expected to acquaint their respective personnel with the following guidance.

Ship's Personnel

Ship's personnel (crew) are expected to extend the courtesy of the ship and, to the extent compatible with assigned duties, provide maximum cooperation with project personnel. Any complaints should be forwarded by the Trial Director to the ATHENA System Manager.

Project/Trial Personnel

In general, only those personnel having business will be allowed on the bridge. Other personnel may visit with permission of the Master or the duty watch. Such requests are discouraged when the ship is entering or leaving port, during periods of poor visibility, high ship-traffic activity and when intensive project evolutions are underway.

Project personnel are encouraged to assemble on the open bridge or boat deck to witness arrivals, departures and other events of interest. Please stand clear of line handlers during arrivals and departures and do not obstruct the Master's view.

The Trial Director or his designated representative will advise the Master or his designated representative of any launching, streaming or retrieval activity required. Project personnel shall not take an active part in the actual work unless prior arrangements have been made with the contractor's project manager and the Master. Qualified project personnel should be on hand to advise the Master/Mate of any special handling requirements for trial gear. When, by prior arrangement, Ship's crew works under the direction of project personnel in such evolutions, the TD shall be responsible for safety of the overboarded gear. In general such evolutions must be with the consent of the Master as he cannot be relieved of responsibility for individual safety.

The after deck will be kept clear of all personnel during high speed operations and project personnel shall remain clear of the area while work is in progress. If personnel must be on the after deck during high speed runs, the Master must be informed in advance and such persons shall abide by all safety measures prescribed.

Ship's cranes, winches, tools, rigging, etc. are to be operated by ship's crew only.

Project personnel should direct all inquiries to the Master through the Trial Director or his designated representative in matters concerning work on deck, navigation, safe working parameters, use of ship's equipment, etc. This will prevent the development of conflicting purposes between the ship and project.

Usual meal hours underway (and in port during extended operations) are:

Breakfast	0700-0800
Lunch	1130-1230
Dinner	1700-1800

A daily charge for messing is required of guest personnel. This rate is established by the contract and is payable to the marine contractor. If project evolutions prevent trial personnel from attending regular meal service, arrangements for feeding such persons should be made via the Master.

The night refrigerator is open for your use. Feel free to partake of the cold cuts, leftovers, fruit and soft drinks provided.

Cigarettes, cigars, tooth paste and other Small Store items are NOT sold on-board except when a foreign voyage is planned and "Sea Stores", i.e., bonded merchandise is taken on-board for sale at sea. This will be subject to the Master's discretion and project personnel should inquire about availability prior to sailing.

Consumption of alcholic beverages and drugs (other than prescription drugs) is prohibited aboard the ships. Project personnel in violation of this regulation will have the item confiscated and upon arrival at destination will be prohibited from the vessel.

If the vessel visits a foreign port, project personnel desiring to return alcoholic beverages in bond may do so by delivering same to the Master when reporting aboard. He will clear the items through Customs upon arrival at a U.S. Port and you may carry your purchase off the vessel.

Firearms are prohibited except where called for officially in a trial plan as a sound source.

Fresh water is limited by the capacity of our water tanks and a 240 gal. per day evaporator. Make sure you turn off faucets. Use Navy type showers, i.e., a wet down, turn water off, soap down, turn water on, rinse off, secure faucets.

Daily radio calls are made usually at 0900 and 1500 hours. The Master can handle routine traffic or emergency traffic via the Marine Operator as required. Personal and business calls will be made by Credit Card or collect, only.

Since radio transmissions sometimes interfere with laboratory data collection, the Trial Director is notified prior to all radio transmissions. Do not tamper with the Radios, Radar or other equipment in the Radio Room. Radio frequencies are guarded as required by law and the program.

Radar settings should not be changed as the Master or Mate may be plotting a Ship Target or other navigational function. A Radar Repeater is available for use of Technical Personnel in the laboratory along with a Compass Repeater, etc.

Smoking is not permitted on-board during fueling operations, signified by Red Flag (Bravo). Because of potential fire hazards, "No Smoking" in the berthing areas will be enforced.

APPENDIX A

CHARACTERISTICS COMMON TO THE ATHENA AND ATHENA II

APPENDIX A

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GENERAL DESCRIPTION

The ATHENAs are converted patrol gunboats of the PG-84 Ashville class. The ATHENA was renamed from "Chehalis" (PG-94) and ATHENA II renamed from "Grand Rapids" (PG-98). Figure A.1 shows both ships underway, with ATHENA in the foreground. Since both ATHENAs were constructed as high speed patrol gunboats, they were engineered to be as lightweight as possible and constructed under high standards of quality assurance. The hull and structural framework are 5086-H32 aluminum alloy and the superstructure is fiberglass over an aluminum framework. The hull is divided athwartships into watertight sections to preserve the stability and reserve buoyancy of the vessel. Watertight bulkheads are installed at frames 12, 23, 39, 69, 103, 124 and 138. The main deck is watertight stem to stern and the platform deck is watertight from stem to frame 69. The physical characteristics common to each ship are listed on the next page.

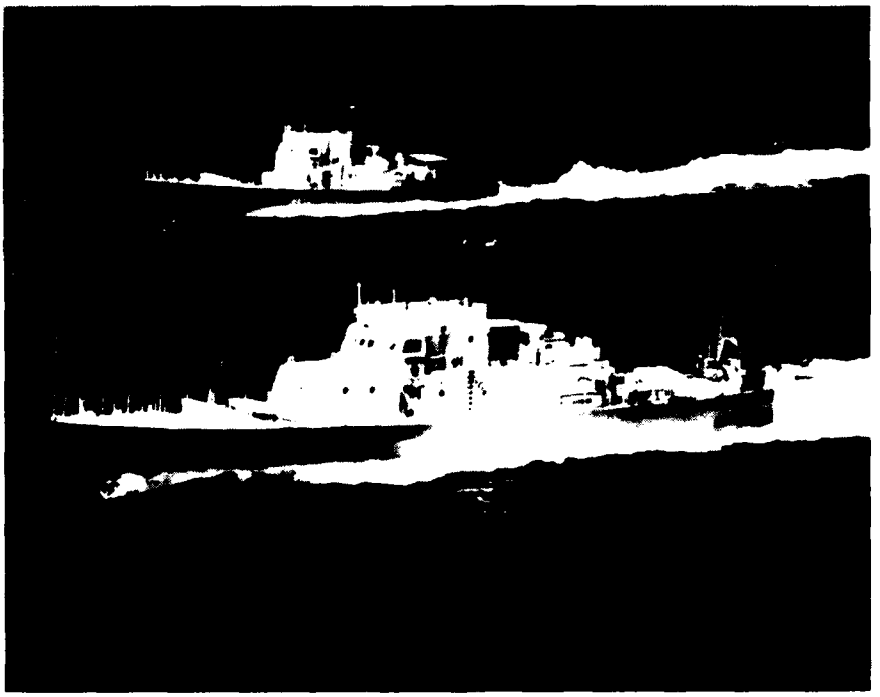

Figure A.1 ATHENA & ATHENA II (Foreground, ATHENA)

PHYSICAL CHARACTERISTICS

Length	164.5 Ft.
Beam	23.8 Ft.
Hull Draft	5.5 Ft.
Navigational Draft	9.5 Ft.
Full Load Displacement	250 Tons
Reserve Buoyancy/Stability	up to 10 tons of deck equipment
Accommodations	15 scientific personnel

BOAT NUMBERS

ATHENA is assigned Navy boat number 165NS761 and ATHENA II, 165NS762.

PERFORMANCE

PROPULSION, FUEL CONSUMPTION AND ENDURANCE

The Propulsion System, which develops and transmits the motive force for propelling the vessel, consists of equipment arranged as shown on Figure A.2. The basic units are:

- Two Cummins Engine Co. Model VT12-875-M Diesel Engines set-up for opposite rotation. Each engine drives its related propeller through a reduction gear in the cruising mode of operation.

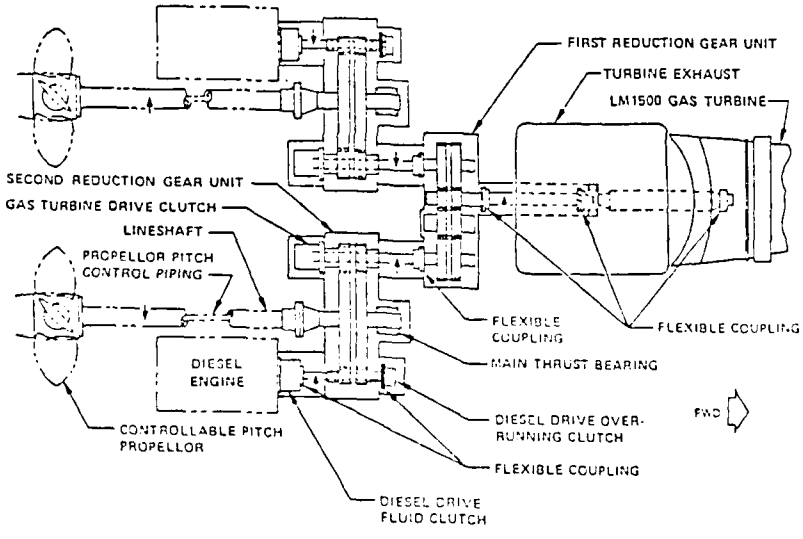

Figure A.2 Reduction Gearing, Clutches, Shafts & Propellers

- One General Electric Co. Model 7LM1500-PE102 Gas Turbine Engine. The turbine drives both propellers, in opposite rotation, through a first and two secondary gearboxes in either the high speed or the gas turbine (G.T.) maneuvering mode of operation.
- One Associated Electrical Industries, LTd. Main Propulsion Transmission System. The system consists of one primary gearbox and two secondary gearboxes to reduce engine speeds to propeller speeds. Clutches are installed to permit clutching or de-clutching of engines.
- Two Liaaen Model D56/4 Double Crank Controllable Pitch Propellers.

In the cruising mode each propulsion diesel drives through a pneumatically controlled fluid coupling, a self-synchronizing diesel clutch and a 6.21 to 1 reduction in its related secondary gearbox to a propeller. In this mode the propeller shafts are driven independently.

In the high speed and gas turbine maneuvering modes, the turbine drives into the primary gearbox where its speed is reduced by 2.29 to 1 and its input divided into two outputs of opposite rotation. Each output then drives through a self-synchronizing turbine clutch and a 3.55 to 1 reduction in a secondary gearbox to its related propeller.

The propulsion system is designed for 13,300 SHP at full turbine power and 1370 SHP at full diesel power. Propusion engines are rated as follows:

Diesels - 725 BHP at 2100 rpm - continuous

Turbine - 12,500 BHP at 5500 rpm of power turbine at 100°F ambient - continuous

14,000 BHP at 5500 rpm of power turbine at 100°F ambient-maximum

In the G.T. mode of operation the ship is powered by the gas turbine but propeller pitch is controlled independently at each propeller. This allows a precision maneuvering capability for special purpose applications.

Performance characteristics common to ATHENA and ATHENA II are listed below.

ATHENA AND ATHENA II

PERFORMANCE CHARACTERISTICS

Speed	0-35+ knots
Propulsion - Diesel (0-13 knots)	2 Cummins VT-12
- Turbine (0-35+ knots)	1 G.E. LM-1500
Propellers	2 Liaaen controllable pitch
Fuel capacity - ATHENA	17,000 gals.
- ATHENA II	15,000 gals.
Range - ATHENA	2700 n.m. with 10% reserve @ 13 knots
- ATHENA II	2400 n.m. with 10% reserve @ 13 knots
Electric power	
- ATHENA*	2-100 kw ship service generators
- ATHENA II	2-200 kw ship service generators

Fuel consumption curves for the main diesels, the gas turbine and the main ship service generator are shown respectively in Figures A.3, A.4 and A.5. These curves represent actual measurements made on the propulsion plants. Variation of these data may occur, however, due to environmental factors.

TOWING CAPABILITIES

An estimate of maximum tow-bar loads as a function of speed is shown on Figure A.6 for ATHENA and ATHENA II.

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* A separate generator for laboratory power is installed on ATHENA. Particulars are given in Appendix B.

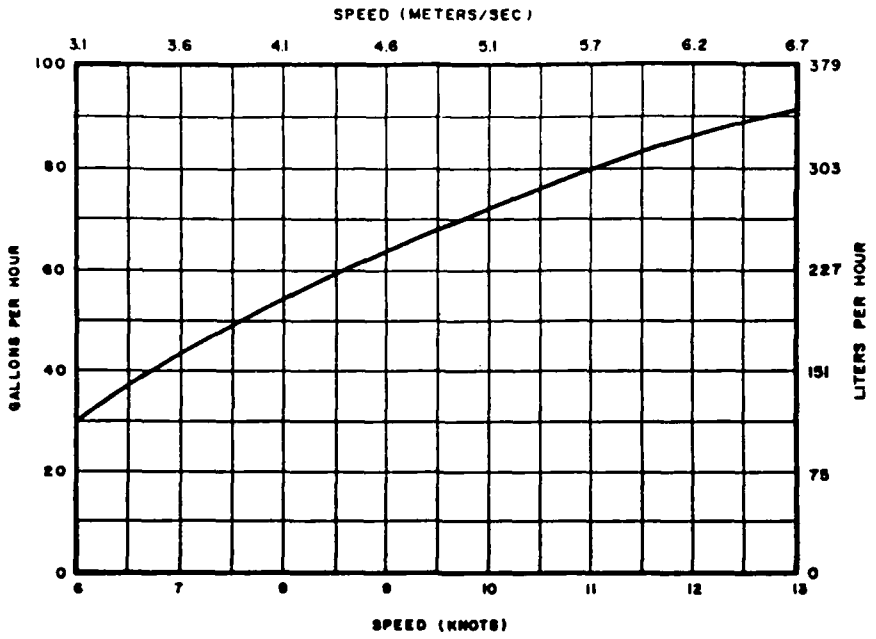


Figure A.3 Fuel Consumption for Cruising Mode (Twin Diesel Propulsion)

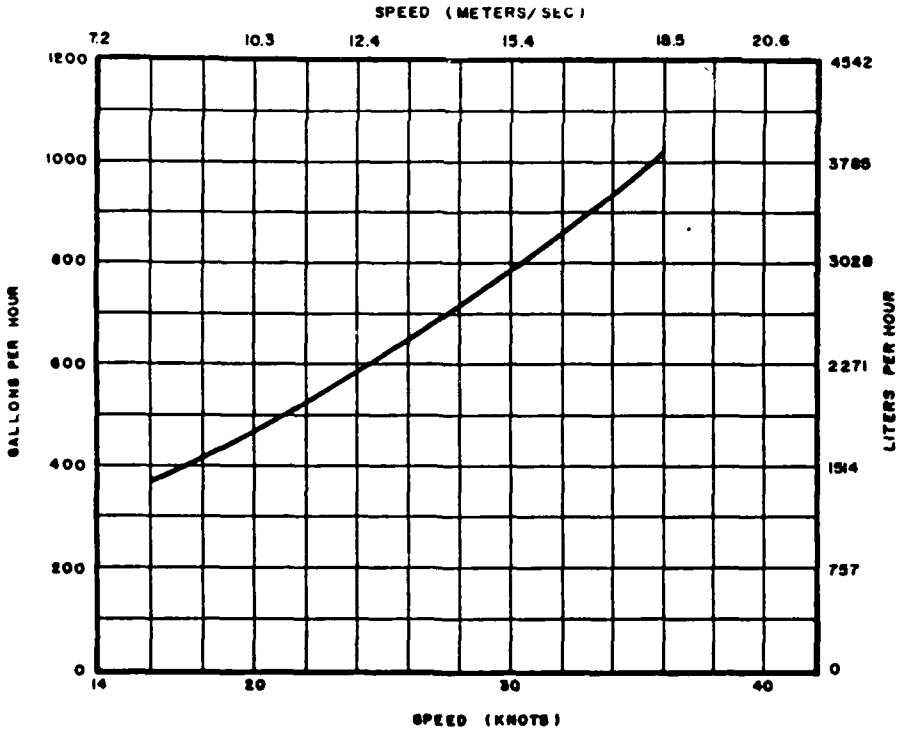


Figure A.4 Fuel Consumption for High Speed Mode (Turbine Propulsion)

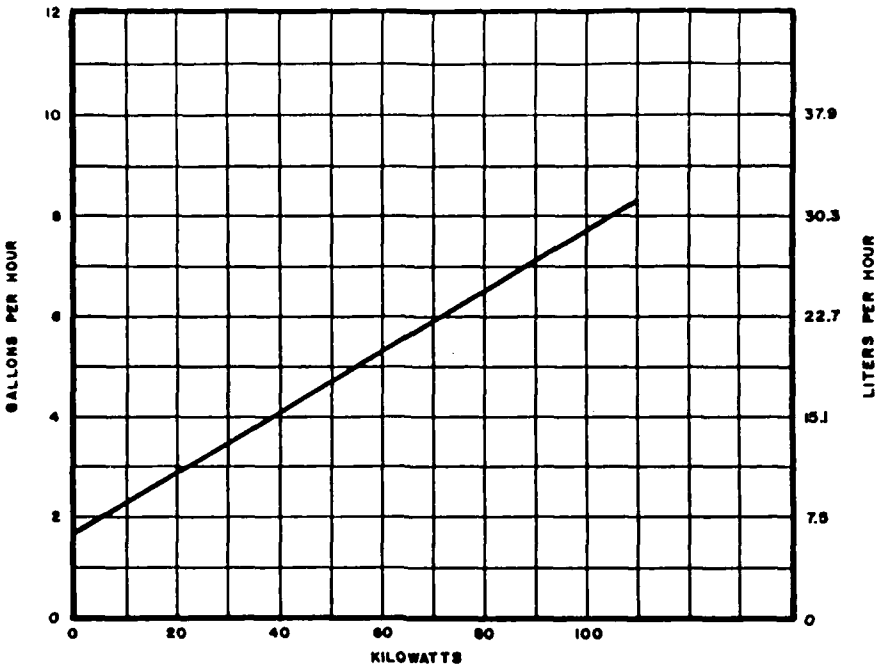


Figure A.5 Fuel Consumption for Main Ships Generator

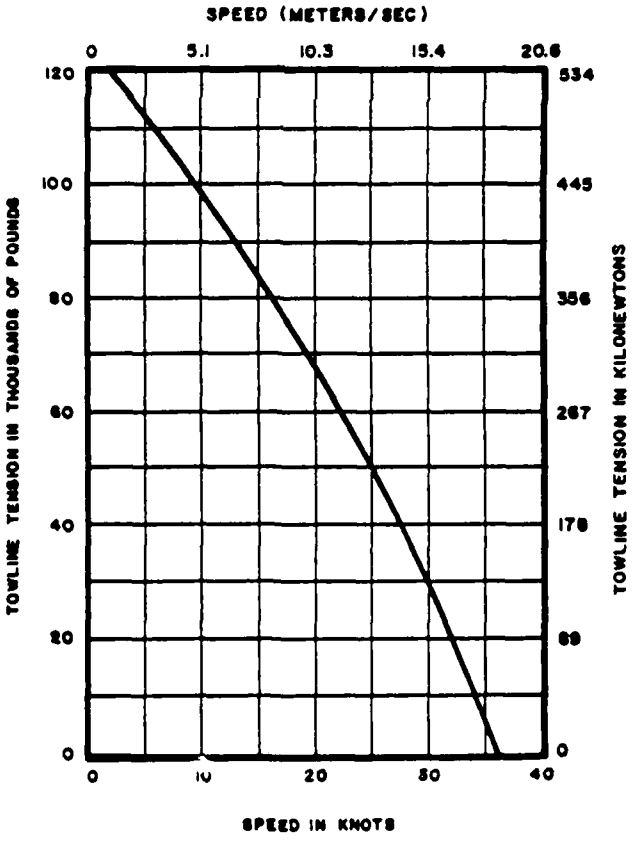


Figure A.6 Estimated Towing Capability of ATHENA and ATHENA II at Full Power for a Displacement of 250 Tons

APPENDIX B

ATHENA TRIAL CAPABILITIES

APPENDIX B

CONTENTS

ARRANGEMENT OF DECKS

The arrangement of decks and compartmentation of ATHENA and ATHENA II are very similar but vary with respect to the location of the laboratories and in certain other particulars. The arrangement of ATHENA is shown on Figure B.1. The locations of various handling equipments, overboarding gear and other ancillary devices are also identified.

EQUIPMENT

MECHANICAL

ATHENA is equipped with various pieces of mechanical gear that may be utilized by embarked projects. Certain pieces of gear are interchangeable between ATHENA and ATHENA II. These items are so identified.

Handling and Towing

The ATHENA is equipped with three major pieces of deck handling equipment: 1) an oceanographic towing winch, 2) an overboarding A-frame, 3) a deck crane. The location of these equipments on the after deck is shown on Figure B.1, and in more detail on Figure B.2. In addition, a number of deck extensions, rollers, etc. are available for project use.

Oceanographic Towing Winch. ATHENA is equipped with an Oceanographic Towing Winch System, which consists of a winch, a control stand and a power pack. Characteristics are shown below:

Winch Characteristics

MAKE	TRACOR MARINE MODEL W-34
Drum Diameter	24", 36" or 60"
Flange Diameter	72"
Drum Width	60"
Line Speed	100 FPM (average)
Reel in Capacity	10,000 pounds @ 24" drum diameter
Towing Capacity	20,000 pounds
Storage Capacity	17,000 ft. of 1" diameter Cable with 24" drum 14,000 ft. of 1" diameter Cable with 36" drum
Power	40 H.P. electro-hydraulic power pack driving a Hagglund low speed high torque motor.

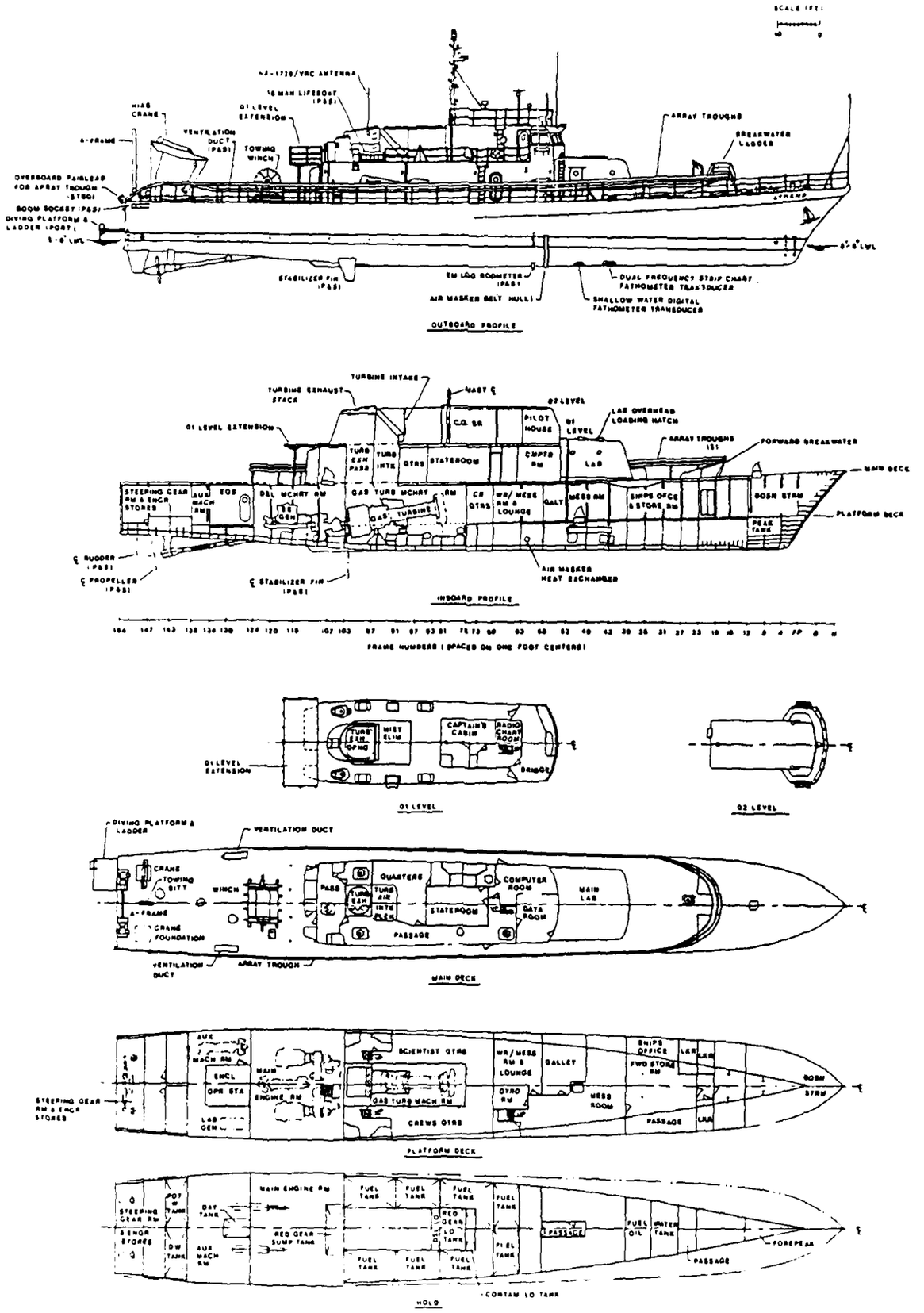


Figure B.1 - Profiles and Arrangement of Decks - R/V ATHENA

The 36 and 60-inch diameter drums are removable. The electro-hydraulic power pack is located on the starboard side of the diesel engine compartment. The winch is secured by bolting to a welded foundation. It is thus readily removed and installed.

User-provided or leased winches may readily be substituted for the oceanographic winch to meet special project requirements.

A-Frame. The A-Frame specifications are listed below. Its location is shown on Figure B.2 and further particulars are given in Figure B.3.

A-Frame Specifications

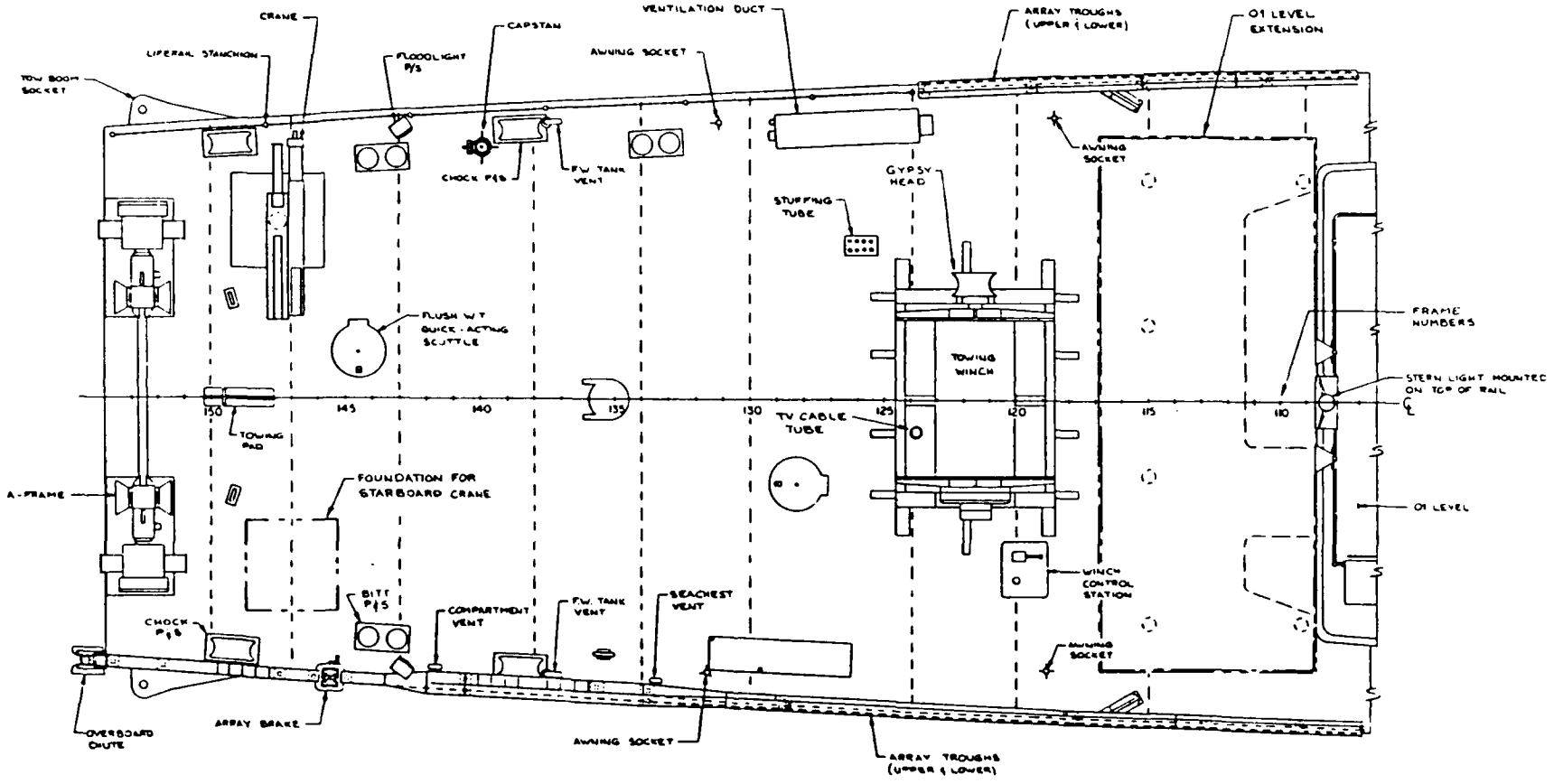
Distance between Uprights (at crossbar)	6 feet.
Height of Crossbar above Deck	14.3 feet.
Size of Crossbar	4" Sch 120
Capacity	7000 pounds

Snatch-block type towing sheaves of 24-in. and 36-in. tread diameters are available for use with the A-Frame or for other purposes. User provided sheaves are readily installable.

Deck Cranes. ATHENA is equipped with two deck cranes mounted at the fantail, one each port and starboard (See Figures B.1 and B.2). Normally, only the port crane is carried. Crane specifications are listed below.

Crane Specifications

Type	HIAB 650/AW
Range	30' vertical 21' horizontal
Lifting Capacity:	
@ 21 feet	1980 pounds
@ 16 feet	2650 pounds
@ 12 feet	3530 pounds
@ 9 feet	4410 pounds
@ 6 feet	6620 pounds



MAIN DECK AFT

Figure B.2 Arrangement of ATHENA After Deck
NOTE: Frame Spacings are on One Foot Centers

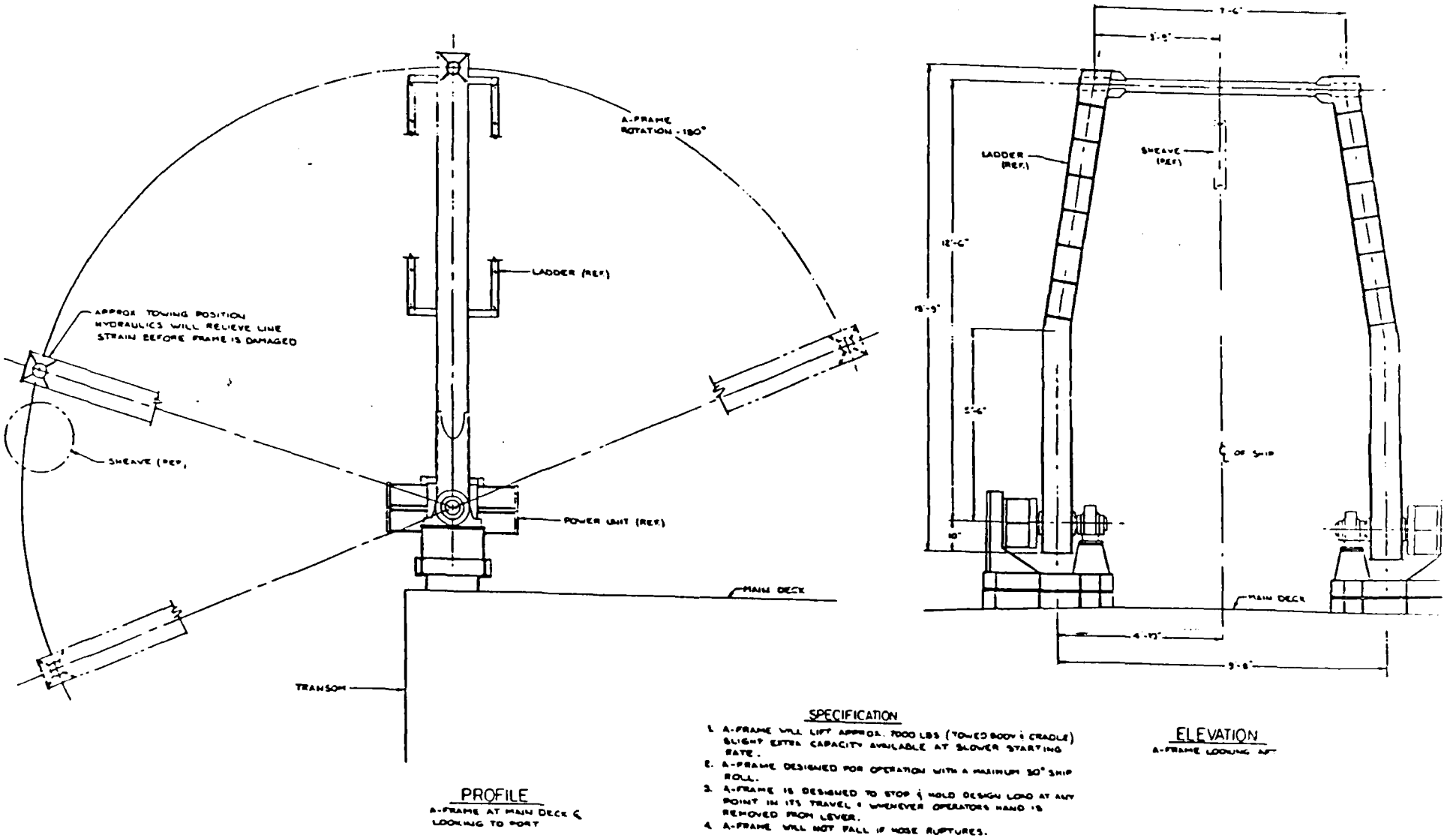


Figure B.3 A-Frame Installation on R/V ATHENA and ATHENA II

Array Troughs. Troughs for handling towed arrays or similar long, flexible items are installed on ATHENA. These troughs consist of rectangular units with aluminum sides and bottom mounted rollers, extending 230 ft. from the stern around the foredeck and back to the stern as shown on Figure B.1. Side rollers are provided where the troughs bend about the foredeck. Two units, mounted in an over/under configuration, can handle modules of up to 3½ inches. A sample cross-section is shown on Figure B.4.

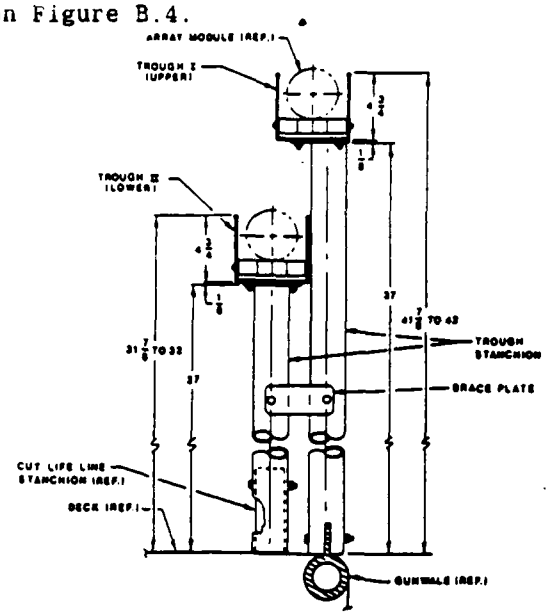


Figure B.4 Sample Cross-Section of Array Troughs

Towing Pad. A towing pad with a load capacity of 40,000 lb. line pull is installed at frame 150 on ATHENA and ATHENA II, see Figures B.1 and B.2.

Towing Booms. ATHENA has the capability for performing multiple tows by means of booms extending port and starboard. These booms are available on special request. The design load limits (factor of safety of 3) are shown on Figure B.5.

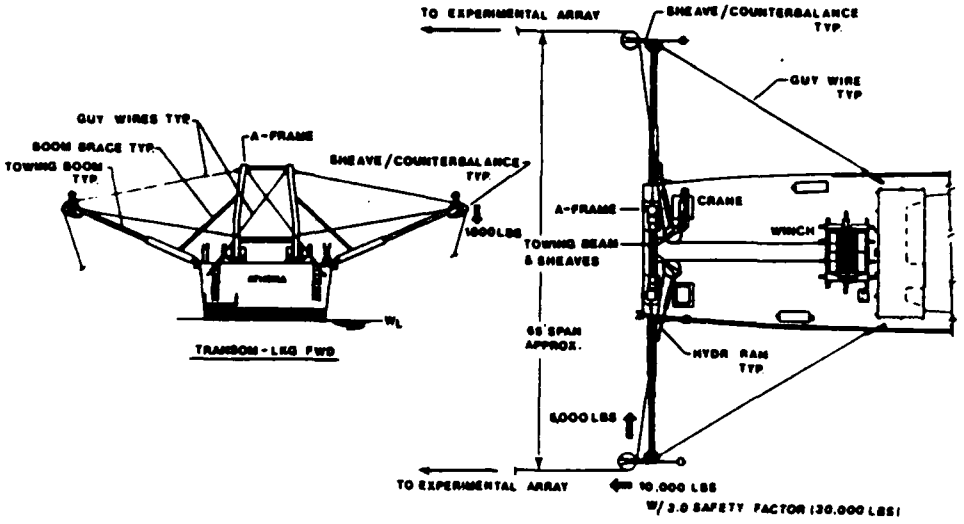


Figure B.5 Arrangement of Towing Booms on R/V ATHENA

Other Equipment

01 Level Extension. A removable platform that extends the 01 level aft by 8 ft. is available. This extension, shown on Figures B.1 and B.2, is convenient for mounting extra cable reels, power supplies, etc. The maximum allowed weight on the extension is 10,000 lb.

Diving Ladder and Platforms. ATHENA is equipped with an over-the-side ladder and diving platforms located on the transom, as shown on Figure B.1.

Stern Platforms and Towing Rollers. Various stern platforms, round-overs and towing rollers are available for use on ATHENA. Users are invited to inspect these equipments to determine suitability for their project.

Roll Fin Extensions. Extensions attachable to the port and starboard roll fins are available for supporting certain types of underwater gear. The general arrangement of the extensions is shown on Figure B.6. The extensions are fitted to the roll fins by mounting shoes that also can serve as a mount for underwater gear. The extensions may be installed by divers and may be folded aft (to reduce the navigational draft) by means of a hinge located near the aft end of the plate on the bottom of the shoe.

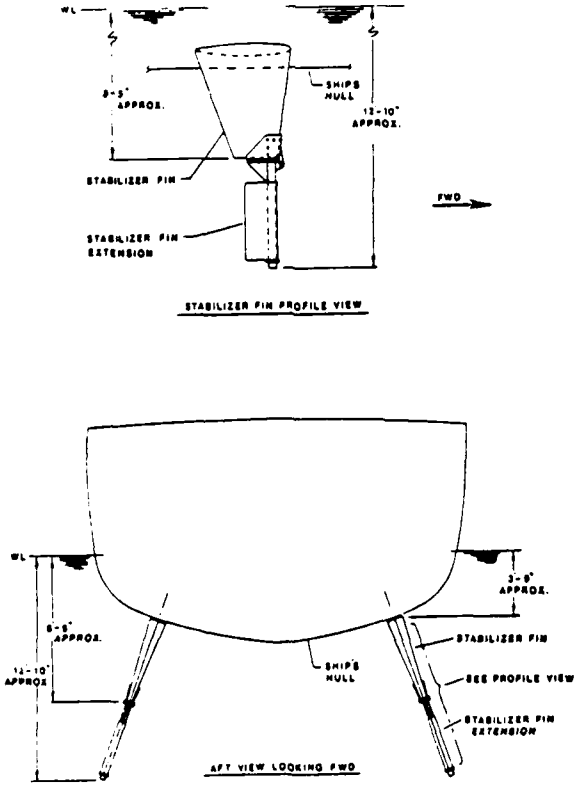


Figure B.6 Roll Fin Extensions for R/V ATHENA

Cooling Water Intake Baffles. When the Masker system was installed, short ogive shaped extensions having a 3:1 fineness ratio were designed for installation on the cooling water intakes to prevent Masker air from entering the cooling water pumps. They were found to be not required for most operational conditions. They have been found useful as mounting plates for underwater equipment of moderate size; in particular for mounting underwater television gear described later.

ELECTRICAL/ELECTRONIC

Navigation

The navigation equipment available on ATHENA is listed below:

Radar	- Raytheon Model AN/SPS 64V1 64 n.m. Range. (Commercial designation - 1225 6XR)
Loran C	- NORTHSTAR 800
Loran Course Plotter	- FURUNO MODEL FP-300
SAT/NAV	- Magnavox MX 1105 Satellite/Omega Navigator.
Fathometer	- Raytheon Model #JFF-720 Dual Transducers 200/50 khz chart recorder.
Fathometer	- Impulse 960 - Shallow water digital depth recorder.
Knotmeter	- Gould/CID Model UL-100, digital readouts - bridge, lab & EOS.
	- Kenyon Model KS-245, digital readouts - bridge and lab.
Gyro-compass	- Sperry Mark 23 Mod C-3.

Communications

Internal. ATHENA is equipped with Navy 1CK and 2JV circuits. The 1CK serves the fantail, bridge, laboratory, wardroom and enclosed operating station (EOS). The 2JV circuit is used for bridge and EOS, exclusively.

External. ATHENA is equipped with the following external communications suite:

SSB Transceiver	-	STEPHENS Model 222
SSB Transmitter	-	AN/URT-24 HF 100 watt. 2.0-30.0 MHZ Frequency Range.
SSB Receiver	-	R-1051B 2.0-30.0 MHZ Frequency Range.
VHF	-	Collins Model #MR-201 VHF-FM.
VHF	-	RAY-55 (Lab).
UHF	-	AN/URC-9A.

Television

Fantail, Laboratory and Pilot-House. Television cameras may be mounted on the afterdeck, typically looking aft from the house, to monitor activities on the afterdeck. The signals may be routed to closed circuit receivers in the pilot-house and/or laboratory via the cable troughs mounted on the port side of the ship.

Underwater. A television camera may be mounted below the starboard (no. 1) cooling water intake baffle. A tripod mount is available for project use. The camera is held in a clamp-type mount and the cable (power and signal) is led from the back of the camera around a shield and thence upward through the cooling water intake through a pipe that leads up to the main deck, just inside the after thwartship frame of the oceanographic winch foundation. This unit may be used at all ship speeds.

LABORATORY

ATHENA is equipped with an air conditioned instrumentation laboratory located on the main deck from frame 64 forward to frame 38 (see Figure B.7). The decking has prepositioned inserts used for securing "Z" bars, used to hold the bottom plate of instrumentation racks. A standard sized bottom plate, 22" wide x 28" deep x ¼" thick, has been selected in an attempt to standardize the mounting of each rack. This system is shown in detail on Figure B.8. Standard-size instrumentation racks are available for project use but project supplied racks may be used instead.

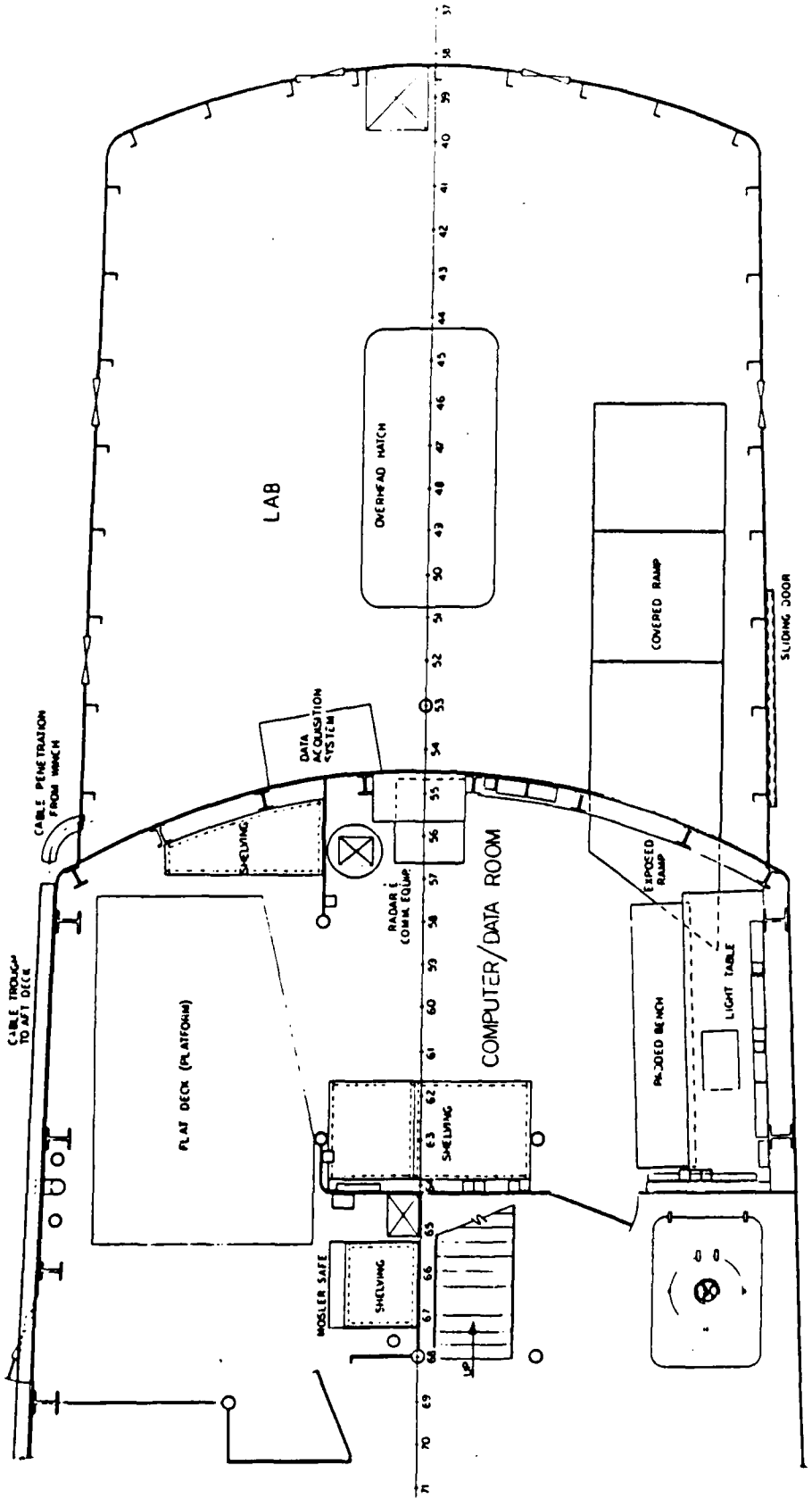


Figure B.7 General Arrangement of R/V ATHENA Laboratory

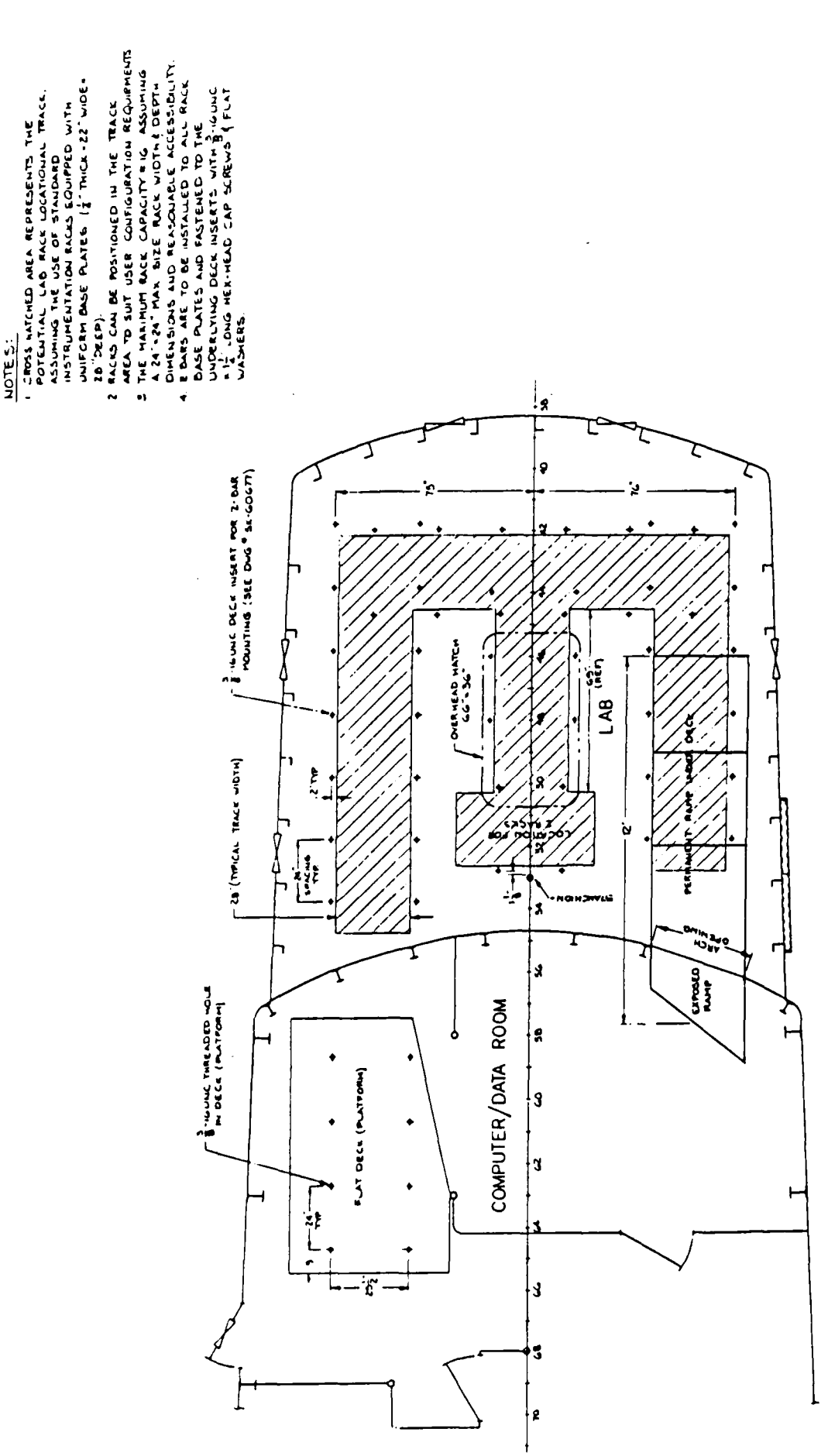


Figure B.8 Instrumentation Rack Mounting Scheme Used on R/V ATHENA

LABORATORY EQUIPMENT

The electronic equipment listed below is located in the ATHENA laboratory and is available for use by project personnel:

Item	Description
Radar	- Raytheon Model 1010 daylight viewing, 64 N.M. range.
Radio, VHF	- Raytheon Model Ray-55.
Radio, SSB	- Texas Instruments Model 3000.
Speed Logs	- Gould Model UL 102-3. 2 fixed swords with readouts for bridge, laboratory, and the enclosed operating station (EOS)
	- Kenyon Model KS-245 with readouts on the bridge and in the laboratory.

LABORATORY POWER

Laboratory power for critical instrumentation is supplied by a dedicated 20 KW (22.5 KVA) diesel driven generator set operating at 1200 RPM and regulated to 460 volts, 3 phase, 60 Hertz output. Frequency stability is controlled by the engine governor on the prime mover. The governor is set for maximum frequency variation of 1 Hz from no load to full load. The initial voltage stability is provided by a Basler 3 phase sensing voltage regulator.

The generator power feed is through a switchboard located in the EOS. From there power is fed into four panels located in the laboratory, each having 5 KVA (40 amps) service (Panels A, B, C, & D). Voltage stability is further enhanced at Panels A and B by interposing SOLA CVS Model 23-26-250 constant voltage sinusoidal type regulating transformers. The result is full isolation from the grounds and a significant improvement in output voltage regulation (typically 1% from no load to full load), particularly for resistive loads. At Panels C & D, voltage stability is provided by Stabiline voltage regulators type EMT-4112 BR.

Available laboratory power is as follows:

120V	60 Hz (regulated)	1 phase
120V	60 Hz	1 phase
120V or 208V	400 Hz	1 phase
120V or 208V	400 Hz	3 phase
208V	60 Hz	3 phase

A one-line diagram of the laboratory power distribution is shown in Figure B.9. The location and types of outlets available are shown in Figure B.10.

DATA ACQUISITION SYSTEM

A system for acquiring and displaying certain operational and ship-status data is located on the after bulkhead of the laboratory. The following data are displayed on digital readouts:

Wind speed & direction (relative)

Ship's course

Rudder angles - port & starboard

Propeller pitch and RPM - port and starboard

Ship's pitch and roll

Time

Ship's speed through water

Taps are available for recording these data in either analog or digital form.

ACCESS

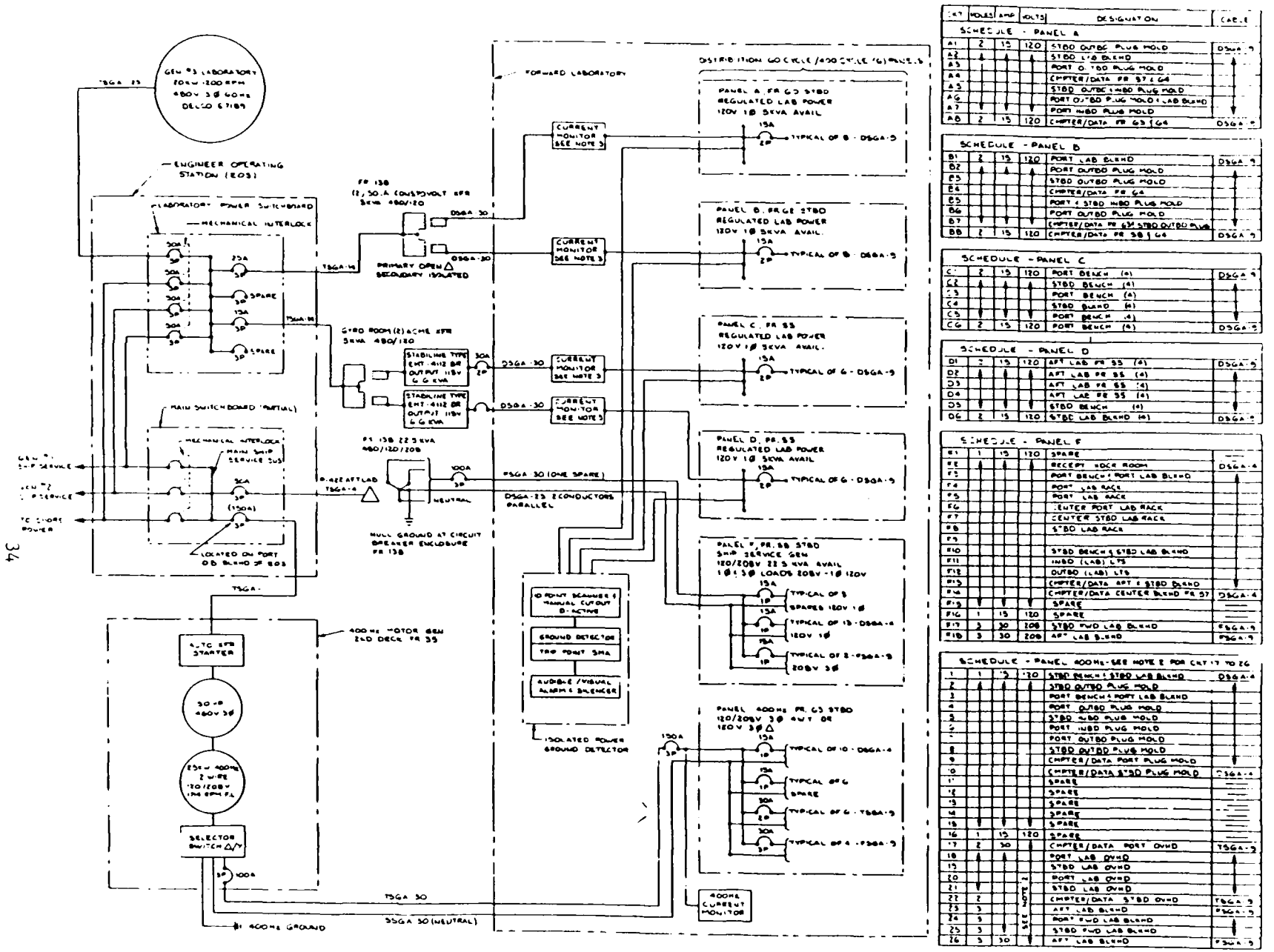
Access to the laboratory is available through the passage on the main deck, a sliding door that opens to the main deck on the starboard side of the laboratory, and through the overhead access patch shown on Figure B.7. The dimensions of the overhead access patch are about 3 by 6 ft.

ACOUSTIC QUIETING

RADIATED NOISE

ATHENA is equipped with a compound air masker system (CAMS) for reducing radiated noise.

CAMS consists of a conventional MASKER belt and a special air system. The Masker belt is installed at frame 59. Air to this belt is provided by the Auxiliary Power Unit. Bleed air for acoustic purposes is also available from the LM-1500 main turbine. The special air system is classified and details of its function and use must be obtained from the System Manager. Appropriate clearances and need-to-know must be established. Diving personnel are required aboard (in addition to regular crew) when CAMS is to be utilized. This cost is a User logistic expense.

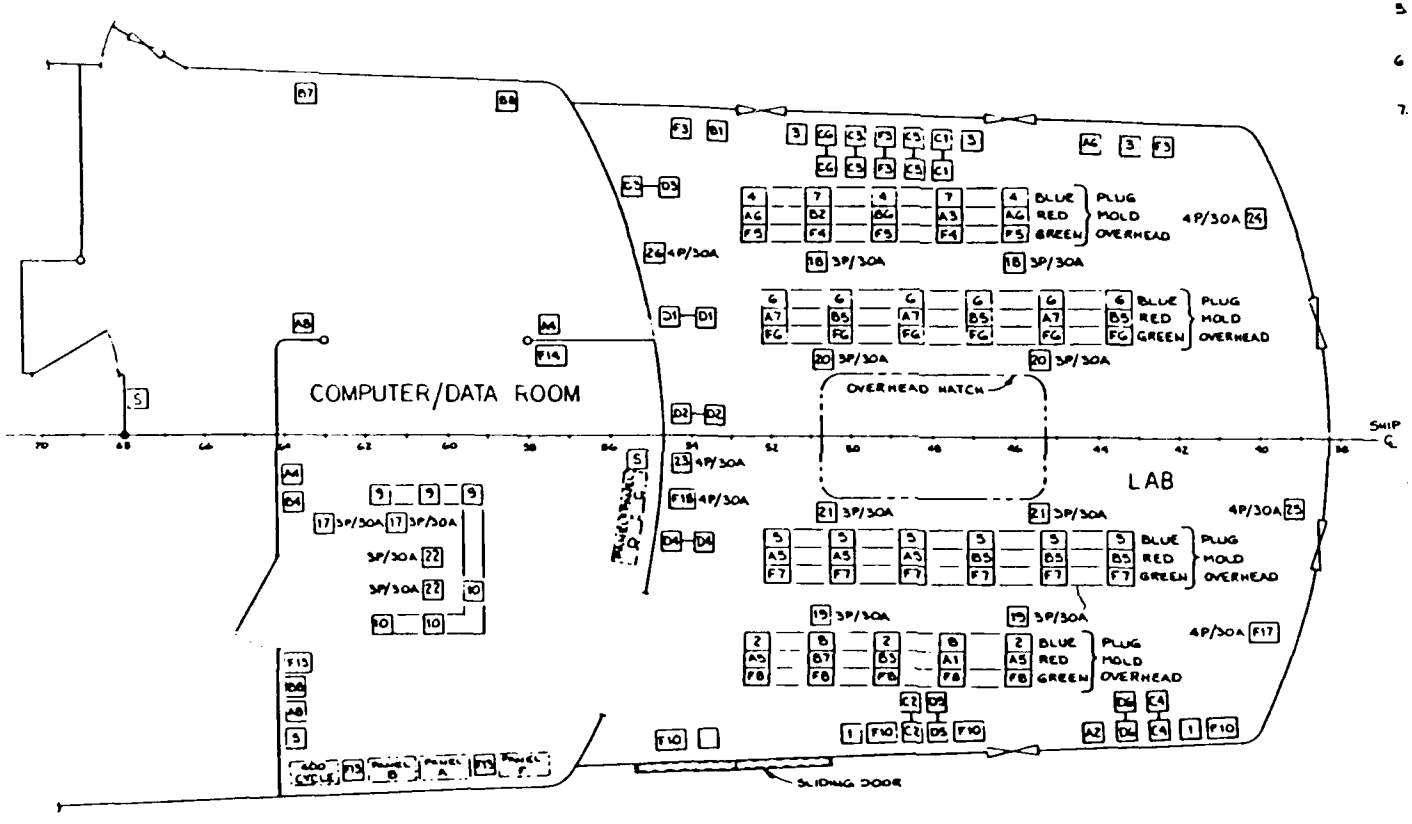


CKT	POLES	AMP	VOLTS	DESIGNATION	CABLE
SCHEDULE - PANEL A					
A1	2	15	120	STBD OUTBD PLUG MOLD	DSGA-9
A2				STBD L'D BLEND	
A3				PORT O TBD PLUG MOLD	
A4				CMPTER/DATA FR 57 & 64	
A5				STBD OUTBD INBD PLUG MOLD	
A6				PORT OUTBD PLUG MOLD & LAB BLEND	
A7				PORT INBD PLUG MOLD	
A8	2	15	120	CMPTER/DATA FR 63 & 64	DSGA-9
SCHEDULE - PANEL B					
B1	2	15	120	PORT LAB BLEND	DSGA-9
B2				PORT OUTBD PLUG MOLD	
B3				STBD OUTBD PLUG MOLD	
B4				CMPTER/DATA FR 64	
B5				PORT & STBD INBD PLUG MOLD	
B6				PORT OUTBD PLUG MOLD	
B7				CMPTER/DATA FR 63 STBD OUTBD PLUG	
B8	2	15	120	CMPTER/DATA FR 58 & 64	DSGA-9
SCHEDULE - PANEL C					
C1	2	15	120	PORT BENCH (4)	DSGA-9
C2				STBD BENCH (4)	
C3				PORT BENCH (4)	
C4				STBD BLEND (4)	
C5				PORT BENCH (4)	
C6	2	15	120	PORT BENCH (4)	DSGA-9
SCHEDULE - PANEL D					
D1	2	15	120	AFT LAB FR 55 (4)	DSGA-9
D2				AFT LAB FR 55 (4)	
D3				AFT LAB FR 55 (4)	
D4				AFT LAB FR 55 (4)	
D5				STBD BENCH (4)	
D6	2	15	120	STBD LAB BLEND (4)	DSGA-9
SCHEDULE - PANEL F					
F1	1	15	120	SPARE	
F2				RECEPT ROCK ROOM	DSGA-4
F3				PORT BENCH & PORT LAB BLEND	
F4				PORT LAB RACK	
F5				PORT LAB RACK	
F6				CENTER PORT LAB RACK	
F7				CENTER STBD LAB RACK	
F8				STBD LAB RACK	
F9					
F10				STBD BENCH & STBD LAB BLEND	
F11				INBD (LAB) LTS	
F12				OUTBD (LAB) LTS	
F13				CMPTER/DATA AFT & STBD BLEND	
F14				CMPTER/DATA CENTER BLEND FR 57	DSGA-4
F15				SPARE	
F16	1	15	120	SPARE	
F17	3	30	208	STBD FWD LAB BLEND	FSGA-9
F18	3	30	208	AFT LAB BLEND	FSGA-9
SCHEDULE - PANEL 400Hz - SEE NOTE 2 FOR CKT 17 TO 26					
1	1	15	120	STBD BENCH & STBD LAB BLEND	DSGA-4
2				STBD OUTBD PLUG MOLD	
3				PORT BENCH & PORT LAB BLEND	
4				PORT OUTBD PLUG MOLD	
5				STBD INBD PLUG MOLD	
6				PORT INBD PLUG MOLD	
7				PORT OUTBD PLUG MOLD	
8				STBD OUTBD PLUG MOLD	
9				CMPTER/DATA PORT PLUG MOLD	
10				CMPTER/DATA STBD PLUG MOLD	DSGA-4
11				SPARE	
12				SPARE	
13				SPARE	
14				SPARE	
15				SPARE	
16	1	15	120	SPARE	
17	2	30		CMPTER/DATA PORT OVHD	TSGA-3
18				PORT LAB OVHD	
19				STBD LAB OVHD	
20				PORT LAB OVHD	
21				STBD LAB OVHD	
22	2			CMPTER/DATA STBD OVHD	TSGA-3
23	3			AFT LAB BLEND	FSGA-3
24	3			PORT FWD LAB BLEND	
25	3			STBD FWD LAB BLEND	
26	3	30		AFT LAB BLEND	FSGA-3

NOTES

1) ON ALL RECEPTACLES [illegible] TERMINAL TO BOND [illegible] TO SHIP STRUCTURE
2) ON 400 Hz PANEL [illegible] 26 2 POLE LAMER S [illegible] 1Ø AND 3-POLE LAMERS [illegible] OR 208V 3Ø
3) SINGLE PHASE CURRENT [illegible] AUDIBLE/VISUAL ALARM [illegible]

Figure 3.9 Laboratory Power Distribution [illegible]



NOTES:

1. ALL RECEPTACLES SHOWN ARE DUPLEX 15A UNLESS NOTED.
2. REGULATED LAB POWER (PANELS A & B) RECEPTACLES ARE IDENTIFIED BY (1) CONFIGURATION & RED COLOR CODE PLUG MOLD.
3. REGULATED LAB POWER (PANELS C & D) & SHIP SERVICE RECEPTACLES ARE IDENTIFIED BY (1) CONFIGURATION & GREEN COLOR CODE PLUG MOLD.
4. F17 & F18 RECEPTACLES ARE 3P/4W 30AMP 208 VOLT.
5. 115V/400 Hz. POWER RECEPTACLES ARE IDENTIFIED BY (2) CONFIGURATION & BLUE COLOR CODE PLUG MOLD
6. SYMBOL S SHOWS DUPLEX RECEPTACLES FED BY SHIPS SERVICE GENERATOR (NOT FED FROM PANEL F).
7. ALL RECEPTACLES ARE POLARIZED TO PREVENT INADVERTENT CONNECTION ON WRONG VOLTAGE AND/OR FREQUENCY.

PLAN VIEW - MAIN DECK

Figure B.10 Physical Location of Laboratory Power Receptacles on R/V ATHENA

HABITABILITY

The interior of the gas turbine compartment has been treated to provide acoustic baffling into the port and starboard berthing spaces. Sound levels ("A" weighted) in these spaces when the turbine is operating are near OSHA limits for long term exposure.

ANCILLARY SUPPORT EQUIPMENT

ATHENA is equipped with a 14-foot Boston whaler, powered by a 25 H.P. outboard motor and a 14-foot inflatable ZODIAC.

APPENDIX C

TRIAL CAPABILITIES OF ATHENA II

APPENDIX C

CONTENTS

ARRANGEMENT OF DECKS

The general arrangement of ATHENA II is shown on Figure C.1.

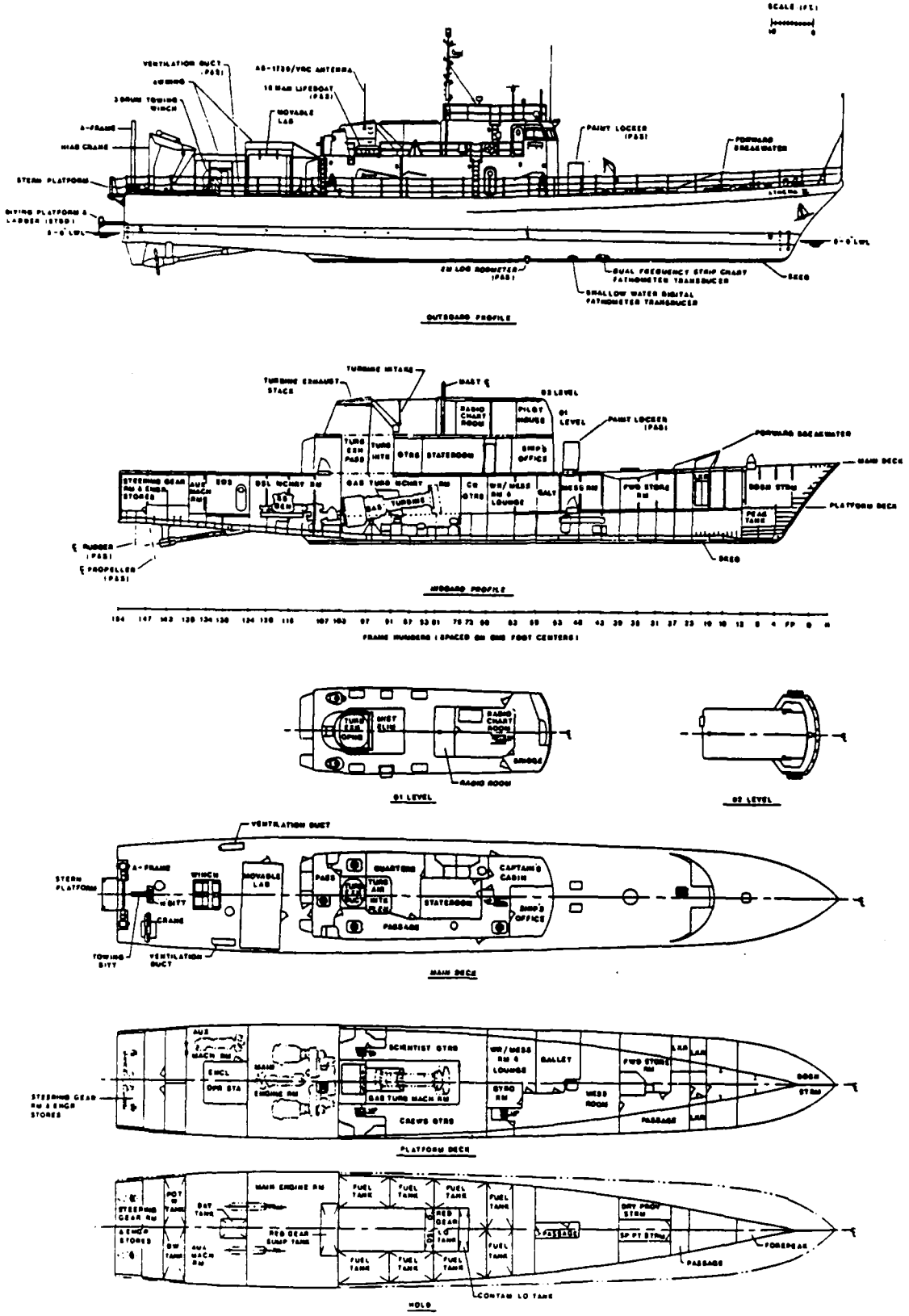


Fig. C.1 - Profiles and Arrangement of Decks - R/V ATHENA II

EQUIPMENT

The equipment available for support of project work on ATHENA II is described in the following paragraphs:

MECHANICAL

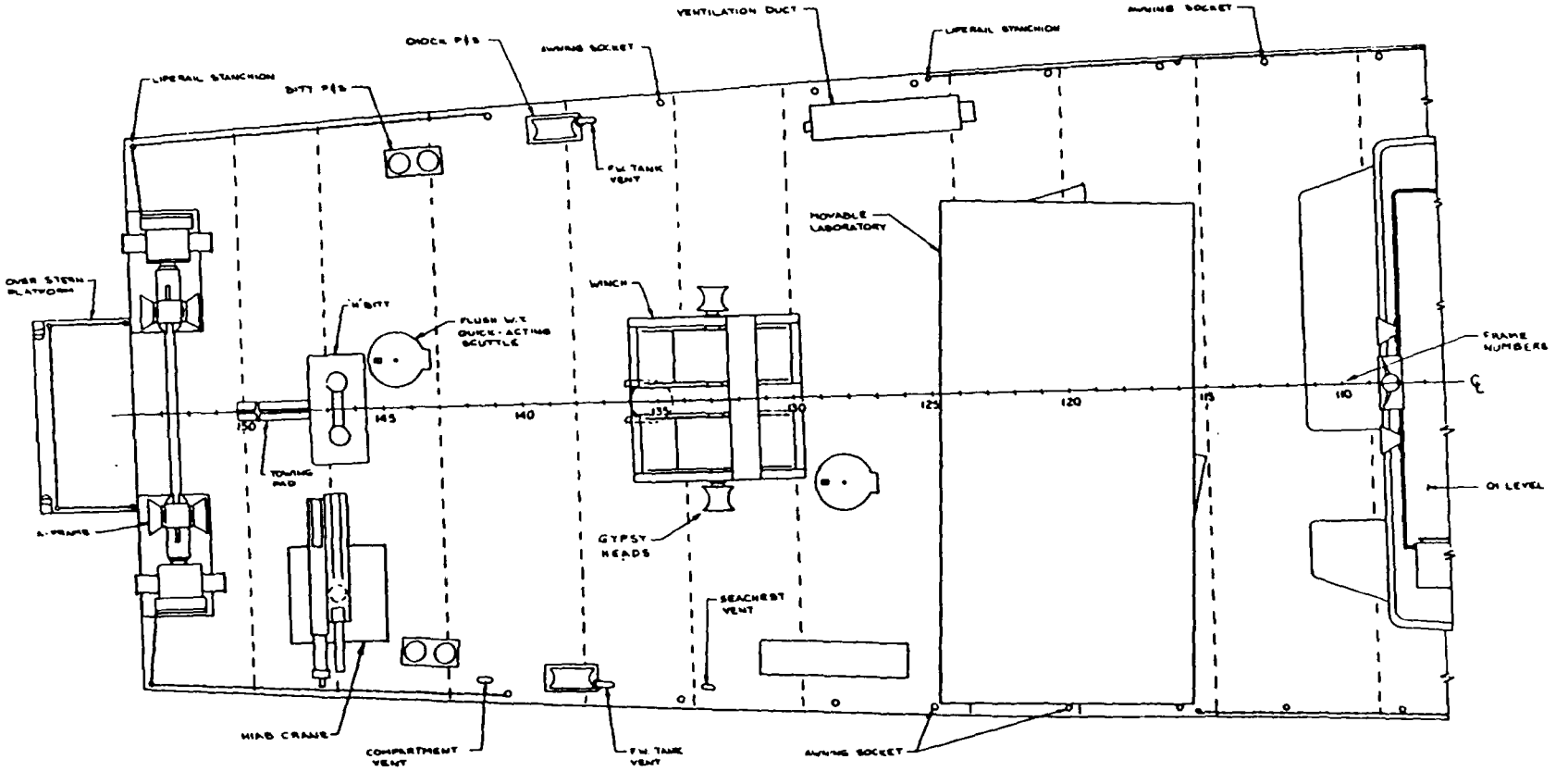
Handling and Towing

ATHENA II is configured with three major pieces of deck handling equipment; 1) a three drum minesweep winch, 2) an overboarding A-Frame, 3) a deck crane. The locations of these equipments of the after deck are shown on Figures C.1 and C.2

Minesweeping Winch. ATHENA II is equipped with a Western Gear minesweeping winch, Model WMSE-25-3. This winch, located on the afterdeck as shown on Figures C.1 and C.2, is an electrically driven, two-speed (full and quarter), horizontal, three-drum, reversing non-magnetic unit with two, 12" diameter, gypsy heads mounted outboard on the drum shaft. The winch is driven by a 25/6.25 horsepower, squirrel cage AC Allis-Chalmers electric motor, through a triple reduction helical gear unit. The electric braking is provided by a spring set, electrically released shoe brake mounted opposite the electric motor on an extension of the reducer high-speed pinion.

The drums, reducer, motor, brakes, and fender roll assembly for the magnetic and acoustic cable reels are mounted on a common, fabricated bedplate. Each drum is engaged to the main shaft by an independently operated, lever actuated, sliding jaw clutch which is keyed to the main shaft. The clutches are locked in the engaged or disengaged positions by spring loaded lock pins. Manual band brakes provided on the drums are engaged by handwheels. Ratchet teeth are cast on the drums for engagement of hand operated, spring returned, load holding pawls. The outer drums are equipped with hand operated, screw actuated, level-wind spooling devices.

The outer cable drums have a capacity of 3600 feet of ½ inch diameter wire rope each, and the inner drum has a ½ inch diameter wire rope capacity of 720 feet. The winch is capable of a drum line pull of 5000 lbs. at a speed of 100 FPM (full speed). All drums are engaged to the main shaft by jaw clutches which slide on the main shaft to which they are secured by 180° keys. The drums can be secured in position by handwheel operated band brakes, the brake drums being integral. The drums also may be secured against loads through hand operated pawls which engage with ratchets on the drum flanges. Drums are bronze bushed to allow free wheeling and are equipped with rope guards.



MAIN DECK AFT

Figure C.2 - R/V ATHENA II, Arrangement of After Deck

The two gypsy heads are keyed directly to the output shaft of the reducer and turn with the shaft at all times. They are retained on the shaft by bolted and lockwired keeper plates. Each gypsy is capable of 13,200 lbs. pull at 62.5 FPM and is designed to handle 4" circumference manila rope.

Design characteristics are summarized below:

WG MODEL WMSE-25-3 DESIGN CHARACTERISTICS

Drum Line Pull = 5000 lbs. at 100 FPM (Full Speed)

Drum Capacity:

Outer Drums = 3600 ft. each of ¼" dia. wire rope

Inner Drum = 720 ft. of ½" diam. wire rope

Gypsy Line Pull = 13,200 lbs. at 62.5 FMP (Full Speed) using 4" circumference manila rope

Drum Pawls and Ratchets Holding Capacity = 7500 lbs.

Drum Brake Holding Capacity = 9850 lbs.

Other winches can be readily mounted on ATHENA II.

A-Frame. The A-Frame on ATHENA II is identical to that on ATHENA (see Appendix B, Figure B.3)

Deck Crane. ATHENA II is equipped with a single deck crane, a HIAB 650/AW, mounted on the starboard side of the after deck as shown on Figure C.2. Characteristics are given below:

Crane Specifications

Type	HIAB 650/AW
Range	30' vertical
	21' horizontal
Lifting Capacity:	
@ 21 feet	1980 pounds
@ 16 feet	2650 pounds
@ 12 feet	3530 pounds
@ 9 feet	4410 pounds
@ 6 feet	6620 pounds

Array Troughs. ATHENA II is not equipped with array troughs.

Towing Pad. The towing pad is identical to that on ATHENA.

Towing Booms. ATHENA II is not presently equipped to handle the towing booms described for ATHENA. Necessary modifications could be made readily and inexpensively, however.

Other Equipment

01 - Level Extension. The 01 - level extension mounted on ATHENA is tranferable to ATHENA II.

Diving Ladder and Platforms. ATHENA II is equipped with a diving ladder and stern-mounted diving platforms, identical to those on ATHENA.

Stern Platforms and Towing Rollers. The stern platforms, round-overs and towing rollers are interchangeable between ATHENA and ATHENA II.

Roll-Fin Extensions. ATHENA II has no roll-fin stabilizers.

ELECTRICAL/ELECTRONIC

Navigation

ATHENA II is equipped with the navigation gear listed below:

NAVIGATION EQUIPMENT
ON ATHENA II

Radar	- Raytheon Model 1210
Loran C w/computer	- Simrad Model LC-204 with Simrad CC-2
Fathometer	- Raytheon Model JFF-720 Dual transducer 200/50 khz chart recorder.
Gyro-compass	- Sperry Mark 23 MODC-3
Knotmeter	- Kenyon Model KS-245, digital readout-bridge only.

Communications

Internal. ATHENA II has the same internal communications equipment as described for the ATHENA (see page 28).

External. The equipment available for external communications on ATHENA II are listed below:

ATHENA II COMMUNICATIONS EQUIPMENT

SSB Transmitter/Receiver	STEPHANS, MODEL 222
SSB Transmitter	AN/URT-24 hf 100 Watt 2.0-30.0 mhz frequency range

SSB Receiver	R-1051B 2.0-30.0 mhz frequency range
VHF	Collins Model MR-201 VHF-FM
VHF	Raytheon Model RAY 48A
UHF	AN/URC-9A

Television

A camera can be mounted on the after side of the house to monitor activities on the afterdeck, with displays in the laboratory and pilot house. No underwater television camera mounts are available on ATHENA II at this time.

LABORATORY

ATHENA II is equipped with an instrumentation laboratory located aft of the deckhouse, as shown on Figures C.1 and C.2, with communication links available to all parts of the ship. A layout of the interior of the lab showing the location of workbenches and available power is shown on Figure C.3. Shock mount strips are available and can be located anywhere within the lab thus offering maximum flexability in installing project instrumentation. The interior temperature is controlled by two 11,000 BTU air conditioning/heaters to maintain the correct environment for both instruments and project personnel.

Power for the laboratory is provided from the ship's 440V distribution panel located in the EOS. This panel selects as a power source either the ship's service generator (underway) or shore power (inport). The following power is available in the laboratory.

120V	60 hz	1 phase
120V	60 hz (regulated)	1 phase
120V	400 hz	3 phase 3 wire
120/208V	400 hz	3 phase 4 wire

LAB CHARACTERISTICS

INSIDE DIMENSIONS	7.75' X 8.5' X 17.75'
WORK BENCH	2' X 5'
DOOR WIDTH	2.5'
ROOF ACCESS HATCH	3' X 5'

INCLUDES FULLY MOVABLE SHOCK MOUNT STRIPS

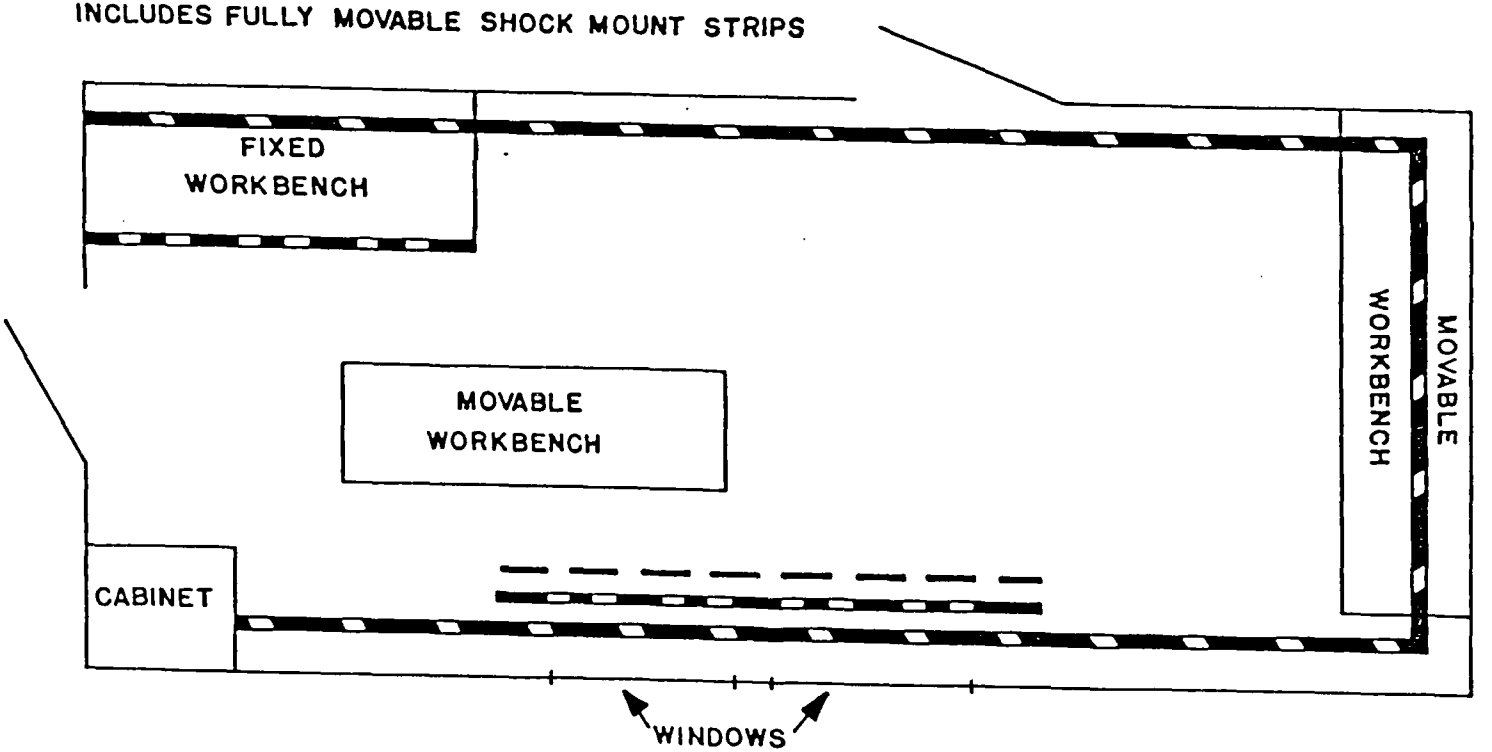


Figure C.3 Portable Instrumentation Laboratory on ATHENA II

ACOUSTIC QUIETING

ATHENA II is not equipped with MASKER and has not been upgraded with respect to acoustic habitability.

ANCILLARY SUPPORT EQUIPMENT

ATHENA II is equipped with a 14 ft. Zodiac propelled by a 9.8 HP outboard motor.

APPENDIX D

SAFETY

APPENDIX D

CONTENTS

INTRODUCTION

Responsibility for the safety of the ship and embarked personnel is the sole responsibility of the Master. It cannot be delegated. Personnel are therefore reminded that the Master's orders may not be questioned or countermanded in any situation involving the safety of ship or personnel.

EMERGENCIES

Emergencies at sea involving fire, foundering or sinking comprise life threatening situations at any time and are exacerbated by heavy weather.

FIRE AND GENERAL EMERGENCY

A fire or general emergency is announced by a rapid ringing of the ship's bell and continuous ringing of the general alarm bells for a period of at least 10 seconds.

ABANDON SHIP

The signal to abandon ship is announced by 7 short blasts of the ship's whistle, followed by one long blast, and accompanied by 3 short rings of the general alarm bells.

RESPONSE

On hearing either of the signals described above, the Trial Director and trial personnel shall don life jackets and assemble on the main deck aft of the house. The TD shall take a roster of trial personnel and report to the Master. Trial personnel shall then stand-by and await instructions. Trial personnel shall not attempt to assist with fire fighting or damage control activities unless requested by the Master or Mates.

LIFE-SAVING EQUIPMENT

Each ship is equipped with two, 15-man, self inflatable life rafts located on the port and starboard sides of the turbine intake stack. These rafts are crew launchable or when submerged, self launchable, by means of a Hydrostatic Release. The rafts are equipped with water, emergency provisions, emergency signals, and minor health care provisions.

In addition to life vests on each bunk, extra vests are stored in the forward laboratory and in the afterdeck house on ATHENA and in the after laboratory on ATHENA II.

MEDICAL EMERGENCY

The first mate and at least one other crew member are required to be Red Cross qualified in Standard First Aid and CPR (Cardiopulmonary Resuscitation). A fully stocked medicine chest and first aid kits are maintained aboard each vessel. Medical emergencies while at dock are referred to the nearest medical facility. While at sea, medical emergiences requiring patient evacuation are handled by contacting a U.S. Coast Guard Search and Rescue Unit.

PERSONNEL PROTECTION

The procedures discussed in the following paragraphs have been adopted to lessen the risk of accidental injury to persons involved in project or ship operations.

EYE PROTECTION

Suitable eye protection (eye shields, goggles, or safety glasses) shall be worn at all times when work involves buffing, grinding or any operations which present eye hazards.

HEARING PROTECTION

When the ships are operated on turbine, acoustic pressures capable of causing hearing impairment are present in designated locations marked "HEARING PROTECTION REQUIRED." Suitable ear protection (ear plugs or ear muffs) shall be used in the designated areas during all turbine operations. Ear plugs are provided to all project personnel prior to sailing. If you do not receive ear plugs or misplace your pair, ask the First Mate for a new set. To ensure everyone has been informed of this directive you will be asked to sign a form stating you have been instructed to wear ear plugs during turbine operations and that ear plugs have been provided.

MACHINERY

Personnel working on or near rotating machinery will avoid wearing clothing with loose ends or loops that may be caught by moving equipment.

LIFE JACKETS

All persons shall wear life jackets when:

- o Working over the side
- o On weather decks during heavy weather
- o Transfer at sea
- o Embarked in small boats, or as otherwise directed by competent authority

LIFE LINES

No person shall lean, sit, stand on or climb over any life line either in port or when underway.

SHOES

All persons shall wear shoes equipped with rubber heels. No person shall wear shoes with taps, cleats or other metal devices on the heels or soles.

WATERTIGHT INTEGRITY

All persons shall ensure that all watertight doors and hatches are completely secured whenever a watertight space is unmanned for even a short period of time.

ELECTRICAL SAFETY

BACKGROUND

Shipboard electricity is not like the electricity found in homes. Everyone knows it is dangerous to handle electricity when in contact with metal or salt water. On board ship you are always surrounded by both, making the 115 volts, normally considered harmless, deadly and the cause of over one-half of all shipboard deaths. In addition, ships are wired differently from homes. Both wires in a two conductor cord are "HOT." Either can kill you if you touch it, but, either can touch the ship's hull without blowing a fuse. This means that a defective tool laying on an aluminum deck is safe, but can kill you as soon as you pick it up. This danger is eliminated by providing a third wire (ground wire) to permanently connect the tool case and ship's hull whenever the tool is used.

PRECAUTIONS

It is the responsibility of each man to observe all electrical safety precautions. Ignoring them shows a complete lack of common sense. Some precautions will be found inconvenient, will slow work and reduce efficiency. Do not be so devoted to duty that you perform in a dangerous manner to increase work output. It is a sobering fact that the need for each safety rule was discovered by men being killed. The following specific precautions shall be followed:

NO PERSON SHALL:

A) Operate, repair, adjust, or tamper with any electrical or electronic equipment unless assigned by proper authority to perform a specific function on certain equipment, except in definite emergencies, and then only when no qualified operator is present.

B) Hang anything on, or secure a line, to any power cable, antenna or other electrical equipment.

C) Approach closer than two feet to a radar or radio transmitting antenna unless it has been de-energized.

D) All protective electrical enclosures are to be kept closed and permanent electrical grounds maintained.

E) All portable tools shall be grounded in a permanent manner.

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